The *Kentucky Academic Standards for Science: An Overview*

Facilitator's Guide

Summer 2019

Contents:

Module Overview:

The *Kentucky Academic Standards for Science: An Overview* Module, developed by the Kentucky Department of Education (KDE), contains the materials to be used in work sessions at the district, school, or department level. This module is intended to support the implementation of the *Kentucky Academic Standards (KAS) for Science* in classrooms across the state.

The duration and scope may be customized to accommodate local needs and conditions. However, it is intended that participants engage in all session in order to gain an understanding of the complexity and rigor of the *KAS for Science*.

Materials:

KDE developed materials that are part of this module:

- *The KAS for Science: An Overview Facilitator's Guide*
- *The KAS for Science: An Overview* slide presentation

These materials are available at KYStandards.org.

Materials also needed for this module:

- Appendix E: *Disciplinary Core Idea Progressions in the Next Generation Science Standards*
- Appendix F: *Science and Engineering Practices in the Next Generation Science Standards*
- Appendix G: *Crosscutting Concepts in the Next Generation Science Standards*
- Appendix I: *Engineering Design in the Next Generation Science Standards*

Goals:

The goals of The *KAS for Science: An Overview* Module are for districts or schools to:

- Explain the Structure of the *KAS for Science;*
- Distinguish between the three dimensions of science, recognizing how they interact with one another; and

- Identify areas needed for further professional learning and support.

At the completion of this module, participants will be able to develop an argument as to how instruction of the *KAS for Science* is the same/different as is generally observed during science instruction.

Intended Audiences:

Participants
Module participants are district teams that may include, but are not limited to, district leadership, school administrators, instructional specialists/coaches, intervention specialists, department chairs, special educators and active or pre-service classroom teachers. In addition, districts may choose to have anyone planning to conduct observations or walkthroughs in science classrooms participate in this session in order to develop an understanding of the standards that should be guiding the instruction observed in the classroom.

Facilitators
Module session facilitators may include, but are not limited to, district leadership, school administrators, instructional specialists/coaches, intervention specialists, department chairs, special educators, classroom teachers and higher education faculty.

Using This Facilitator's Guide:

This facilitator's guide provides suggestions for structuring each section of this module, recommended learning experiences to prompt meaningful discourse of the *KAS for Science* and guidance on talking points to use with the provided presentation.

As you work through the module, there will be learning experiences provided to aid in developing, or reinforcing, participant knowledge of the *KAS for Science.* Facilitators may need to revise specific tasks in order to meet the needs of the participants or to be respectful of the time planned within the work session.

Helpful Hint
It is important to realize that while you are the facilitator of these work sessions, you may not have all the answers to the questions asked by participants - and that is okay! When this happens, reflect on this quote from Graham Fletcher, *"Every teachable moment, doesn't need to be a teachable moment, in that moment."* Use these moments to encourage participants to engage in discussion with other participants so that a shared understanding may be developed. If participants ask questions you are not prepared to answer, offer to seek out answers to those questions and

share with the larger group.

Setup for Success

This module begins with a "Setup for Success" intentionally embedded to promote an environment of trust between facilitators and participants and among the participants themselves. Throughout the module, participants will be expected to collaborate in a variety of ways. Using the "Setup for Success" will be critical for participants to actively participate and accept collective responsibility for the successful attainment of the module goals. Facilitators should feel free to adapt these activities to fit the size of the audience and the space of the work session, but they should be mindful that the "Setup for Success" activities are not randomly chosen 'icebreaker' activities; they have been intentionally chosen within the purpose and scope of the entire module.

Planning Ahead:

- Determine which stakeholders to invite as participants. In the invitation, describe how the work session will benefit them.
- A few days before the meeting, you may want to remind participants to bring their documents to the meeting (see the "Participant Documents Needed" section).
- Reserve adequate space and equipment. Tables should be set up to support small-group discussion.
- Access to the internet for the facilitator will be necessary in order to access the videos embedded within this module.
- Access to the Internet for participants is helpful but may not be necessary depending on how participants plan to engage with the *KAS for Science*.

Preparation:

Participant Documents Needed:

Ask participants to plan ahead regarding how they will feel most comfortable engaging with the *KAS for Science*, either:

- A device with access to the *KAS for Science*
- A hard copy of the *KAS for Science* (at least one per team)

Facilitator Work Session Supplies Needed:

These items will be needed with this module.

- Computer with access to the *KAS for Science: An Overview* slide presentation
- Technology with projection capability including a speaker system
- Copies of Handouts needed for the session
- Issues Bin

  The Issues bin can be used by the participant to note ideas, questions, or issues constructively while the other attendees continue to focus on an activity or lesson. This may be a poster or you may prefer to have a digital Issues Bin where participants can access a Google document, for example, to post questions and that you can modify as the participants work through the sections of the module.
- Poster paper (optional unless otherwise indicated)
- Self-Sticking Notes (optional unless otherwise indicated)
- Colored markers (optional unless otherwise indicated)

Work Session Consideration:

Building a Community

Building a community is important for any group that will work together, especially if participants have not worked together before. The concept is the same as building a safe, respectful, productive classroom climate. Incorporating community-building into each session builds trust, shows participants that they are valuable as individuals and engages them in the learning process. It is also useful for creating a professional learning network where participants can be supported in their work. Community-building can be as simple as allowing participants to introduce themselves and their role in the school/district, developing or refining group norms, allowing for questions and/or the sharing of answers to reflection questions or individual discovery task items that are included in the module. Again, time allotted for community-building will allow participants to have a voice and be engaged as active contributors and learners.

Module 1: The *Kentucky Academic Standards (KAS) for Science*: An Overview

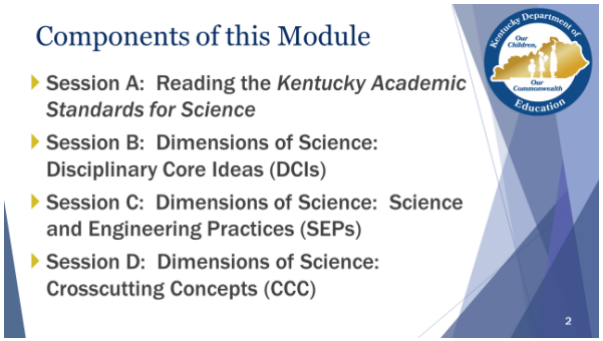
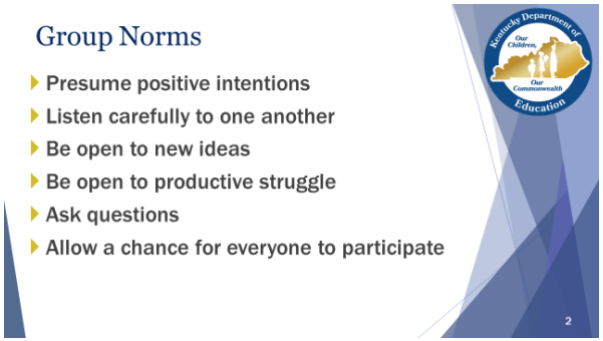
Preparation for Session A: Reading the *Kentucky Academic Standards for Science*

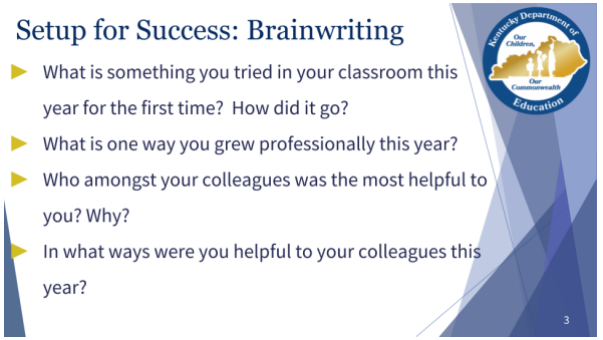
Posters to Make Ahead of Time:

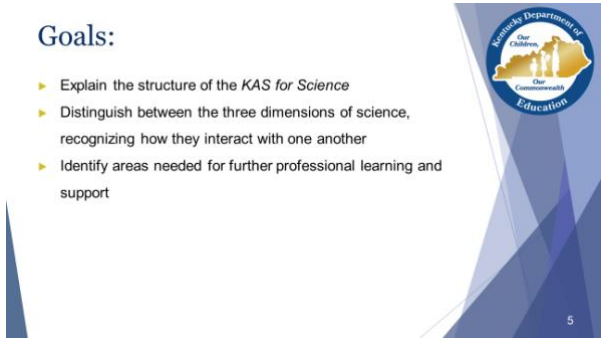
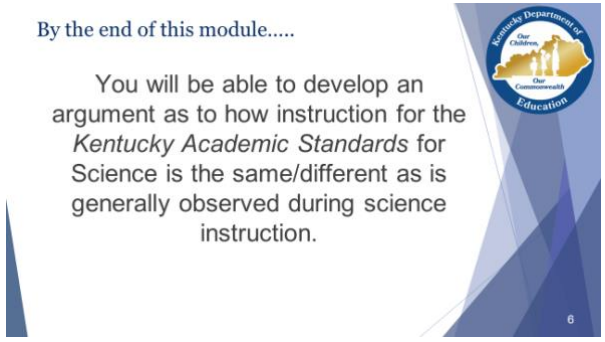
- Issues Bin Poster:
    - Poster can just be labeled "Issues Bin." The Issues bins can be used by the participant to note ideas, questions, or issues constructively while the group continues to focus on an activity or lesson. This may be a poster or you may prefer to have a digital Issues Bin where participants can access a Google document, for example, to post questions and that you can modify as the participants work through the sections of the module.

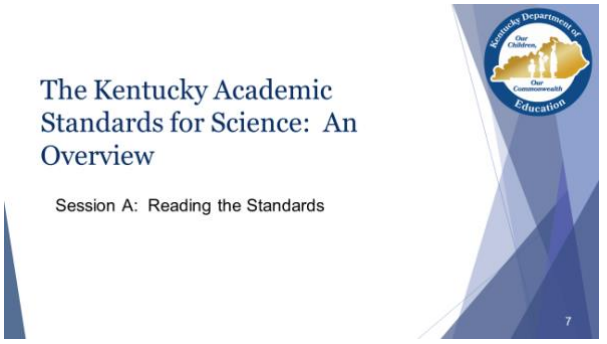
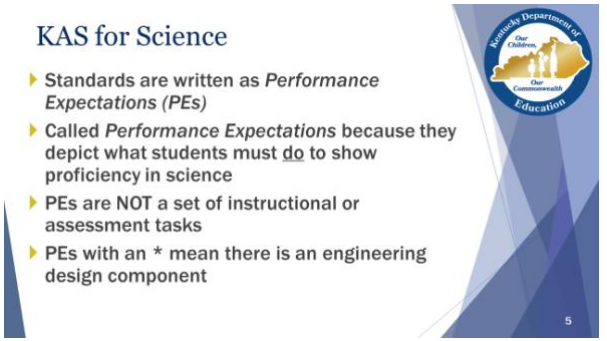
- Setup for Success: Brainwriting
    - Prepare four posters with one of the following questions written per poster:
        - What is something you tried in your classroom this year for the first time? How did it go?
        - What is one way you grew professionally this year?
        - Who amongst your colleagues was the most helpful to you? Why?
        - In what ways were you helpful to your colleagues this year?

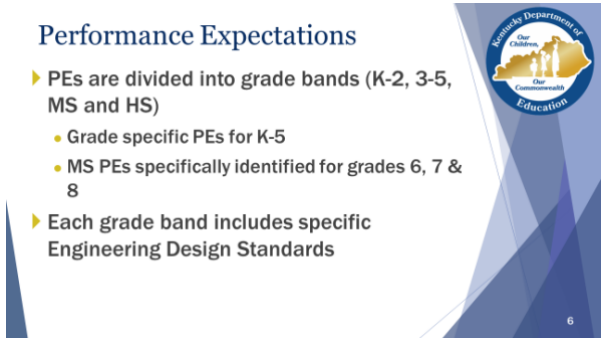
Session A: Reading the Kentucky Academic Standards for Science

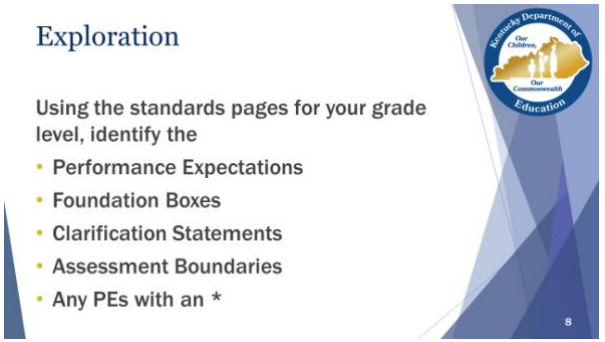
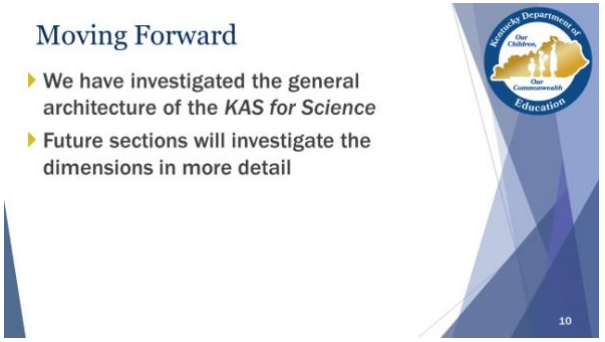
Facilitator Notes	Accompanying Slide(s)
Officially welcome the participants. Introduce yourself (if necessary). **Explain:** "This module is intended to provide an overview, or reinforce your understanding of, the *KAS for Science*.	
Facilitator Notes: *This slide shows the content incorporated within this module.*	
Explain: "Group norms can help to create a safe space where participants feel comfortable sharing their ideas and experiences. This slide is a starter. Take a moment to read the norms." *After people are finished, ask if anyone would like to revise, edit or add any norms to the list. If so, make changes on the slide; if not, move on to your discussion of the Issues Bin.* **Explain:** "I realize you may not want to pose every question to the whole group, or we may not have time in the session to get to every question. Therefore, I want us to have a place for to address those issues."	

Facilitator Notes	Accompanying Slide(s)
Introduce participants to the Issues Bin. The Issues bin can be used by the participant to note ideas, questions, or issues constructively while the other attendees continue to focus on an activity or lesson. This may be a poster or you may prefer to have a digital parking lot where participants can access a Google document, for example, to post questions and that you can modify as the participants work through the sections of the module. The purpose of the Issues Bin is to provide participants with a safe way of asking questions or suggesting ideas. Participants should feel free to add to the Issues Bin throughout the module. *Remember that you may not know all of the answers to the questions, and that is okay! Some issues may be addressed in future sections of this module. If the question is pressing and doesn't appear to be addressed in this module, talk to your district team and determine who would be the best person to contact at the KDE. You may also e-mail questions or feedback to KDEScience@education.ky.gov.*	
Setup for Success: Brainwriting **Explain:** There are undoubtedly great things happening in schools across our state. The process of aligning classroom instruction to the *KAS Science* will be at the center of the continuous improvement we strive for within our teaching practice and, as a result, within our students. Before you can know where you are going, it is helpful to consider where you've been. We are going to begin with that today." *The goal of this activity is for educators to understand that cultivating something better within our classroom doesn't mean forgetting or taking value away from the progress made up until this point. To engage in "Brainwriting" have participants answer three of the four questions from the slide on self-sticking notes (one note per question) and then stick them to the appropriate poster. Have participants do a quick "gallery walk" to see the responses of others to the questions.*	

Facilitator Notes	Accompanying Slide(s)
Facilitate discussion of the responses (if needed). **Explain:** As we progress throughout this module, we hope you will embrace the opportunity to grow professionally and consider how you can work with your colleagues to help one another build off of their current successes to continuously improve the classroom experience for students. *Facilitator Note: Letting participants choose which three questions to answer gives them choice while also allowing educators new to the profession to focus on the last three questions which would still apply in the teacher preparatory experience.*	
Explain: "Throughout this module, the goals are for you to: ● Explain the Structure of the *KAS for Science* ● Distinguish between the three dimensions of science, recognizing how they interact with one another ● Identify areas needed for further professional learning and support.	
Facilitator Notes: *Let participants know that at the completion of all four sessions within this module, they will be asked to develop an "elevator speech" around this statement.*	

Facilitator Notes	Accompanying Slide(s)
	
Explain: "The *KAS for Science* are the *Next Generation Science Standards.* They were officially adopted on June 5, 2013 by the Kentucky Board of Education." *Talking Points:* • Kentucky adopted the Performance Expectations (PEs) as their standards. • Due to the structure of the PEs, students should demonstrate their understanding of science concepts. This has instructional implications in that students should be experiencing science in their classrooms. • An engineering design component means that there is an application of science to solve some human need. *Background notes for Facilitator:* The Next Generation Science Standards (NGSS) are based on *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (Framework)* developed by the National Research Council (NRC). In putting the vision of the *Framework* into practice, the NGSS have been written as performance expectations (PEs), that depict what students must do to show proficiency in science. In order to show alignment and coherence to the *Framework*, the NGSS include the "foundation boxes" in ensure that curriculum and assessment developers would not be required to guess the intent of the PEs.	

Facilitator Notes	Accompanying Slide(s)
Explain: "This is how the *KAS for Science* is broken down." *Talking Points:* • All components of the *KAS for Science* are grade-banded • Kentucky determined into which grade the Middle School PEs would be divided into • Kentucky has associated the High School PEs with some courses that schools may offer. These can be accessed at the Course Standards webpage. • While some PEs may incorporate engineering design principles, there are specific engineering design standards for each grade band. *Facilitator Notes:* For this discussion, you may wish participants to have access to the *KAS for Science*, especially if they are unfamiliar with the layout.	
Facilitator Notes: This video explains the components of the standards page and how to read them. After watching the video, point out: • Due to adoption of new Mathematics and Reading and Writing standards in Kentucky, the connection boxes have been removed. • The examples in the clarification statements are just that—examples. Teachers are not expected to teach each one of these and may choose other examples that relate to the intent of the PE. • Since the standards were written specifically for large-scale (state) assessment, the assessment boundaries determine what can/cannot be assessed on a state assessment. *Facilitators may note here that teachers may choose to go beyond the state boundary in instruction, especially if it will meet the needs of their students.*	

Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: Allow participants 2-3 minutes to explore the standards page for their grade/grade level/course identifying the: • Performance Expectation • Foundation Boxes • Clarification Statements • Assessment Boundaries • Performance Expectations with an * **Explain**: "With others in your [grade/grade band/course] share some findings you had. Discuss any surprises or concerns you may have." *Facilitator Notes:* During this time, you may wish to walk around and listen to the conversations. If there are few people present, you may wish to have one group discussion. When sharing out, have participants share their findings, surprises, ah-ha's, concerns, etc.	
Explain: "We have spent some time investigating the general architecture of the *KAS for Science*. In future sessions we will look at each of the dimensions of science in more detail."	

Module 1: The *Kentucky Academic Standards (KAS) for Science*: An Overview

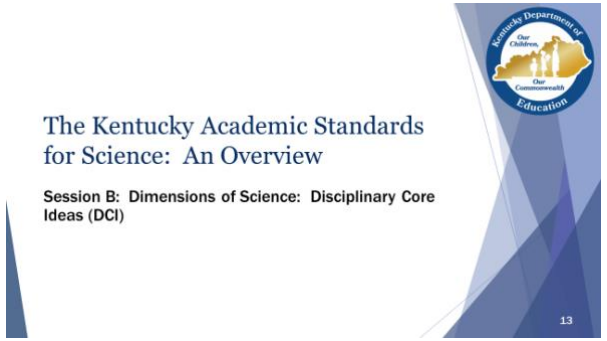
Preparation for Session B: Dimensions of Science: Disciplinary Core Ideas (DCIs)

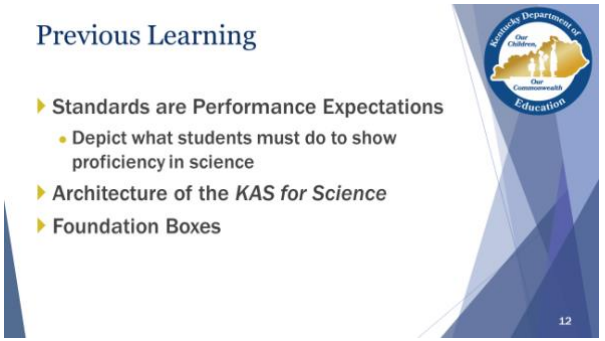
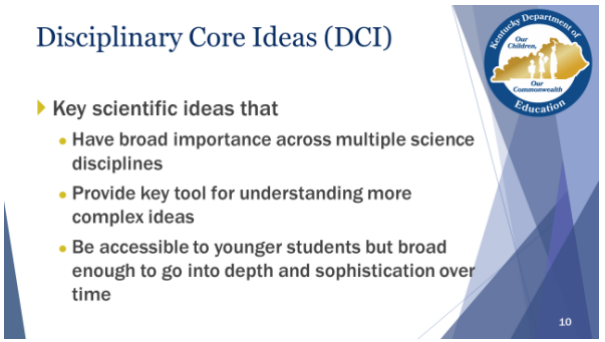
Facilitator Work Session Supplies Needed:

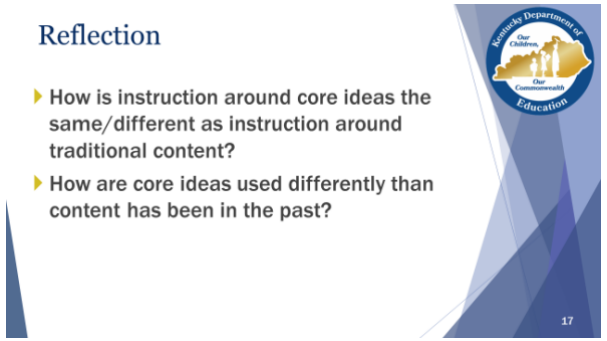
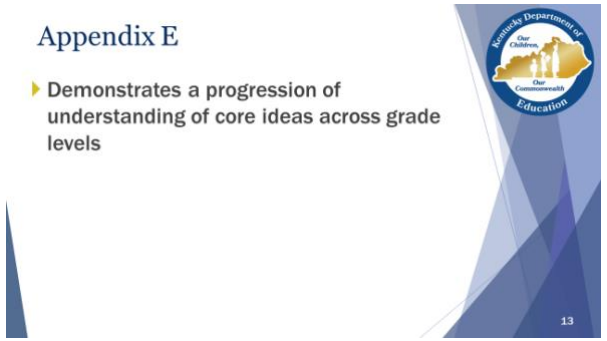
These items will be needed with this module.

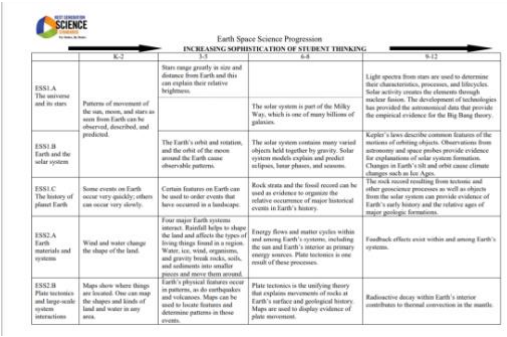
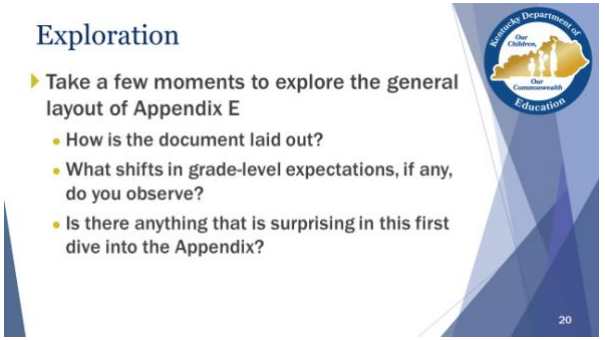
- Computer with access to the *KAS for Science: An Overview* slide presentation
- Technology with projection capability including a speaker system
- Appendix E (paper or electronic)
- Appendix I (paper or electronic)
- Poster paper (if facilitator chooses a gallery walk for DCI sharing)
- Self-sticking notes (if facilitator chooses a gallery walk for DCI sharing)

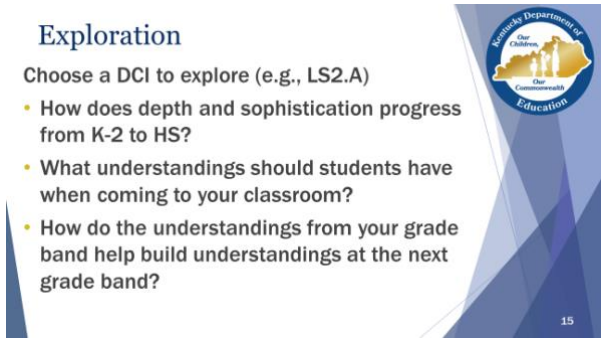
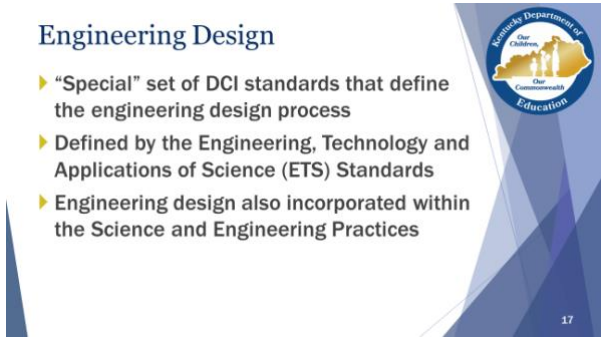
Session B: Dimensions of Science: Disciplinary Core Ideas (DCIs)

Facilitator Notes	Accompanying Slide(s)
Explain: "We will now be investigating the three dimensions of the *KAS for Science*. We will begin with the Disciplinary Core Ideas, or DCIs." *Background Information for Facilitator:* *The Framework focuses on a limited number of core ideas in science and engineering both within and across the disciplines. This decision was made in order to avoid the shallow coverage of a large number of topics and to allow more time for teachers and students to explore each idea in greater depth. Reduction of the sheer sum of details to be mastered is intended to give time for students to engage in scientific investigations and argumentation and to achieve depth of understanding of the core ideas presented. Delimiting what is to be learned about each core idea within each grade band also helps clarify what is most important to spend time on, and avoid the proliferation of detail to be learned with no conceptual grounding. (NRC, 2012)* *There is an additional section on Engineering Design, which also falls under the DCIs. Facilitators may wish to combine the two concepts together or keep them as separate discussions.*	

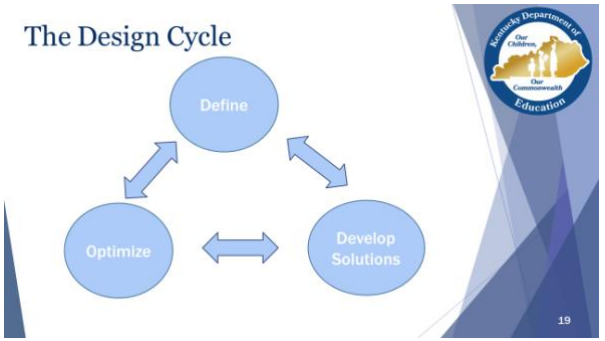
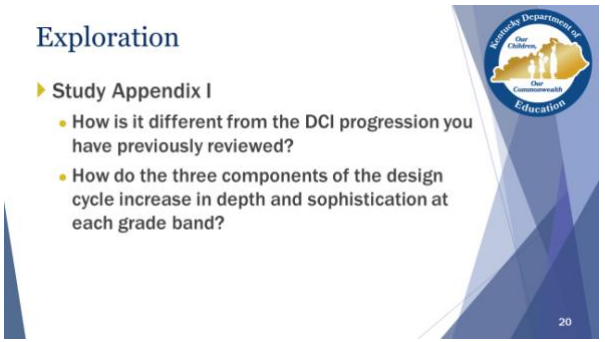
Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *Briefly review learning and experiences from the previous learning, using information on this slide for guidance. You may also bring out any discussions that came out in the previous session.*	
Explain: "Because of the easy access of information, or facts, an important role of science education is to prepare students with sufficient core knowledge so that they can acquire additional information on their own. Therefore, a small set of core ideas that meet these criteria were developed. These core ideas, or elements of them, appear across science domains."	
This video highlights the DCIs and why they are important. After watching the video, participants will be asked to reflect on what they saw and heard. Facilitators may wish to share the questions shown on the next slide in order to set the stage for the video.	

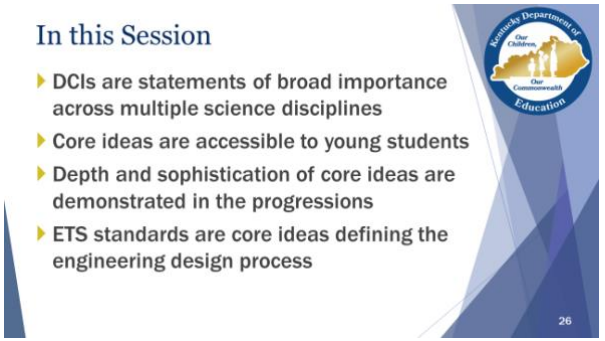
Facilitator Notes	Accompanying Slide(s)
After watching the video, participants should reflect on these two questions. How this reflection could occur is up to the facilitator. However, it is recommended that participants be provided time to reflect individually first before whole group reflection/discussion occurs. *Ideas to listen for:* • *Teaching is not around specific scientific "facts"* • *Instruction is around "big Ideas"* • *Student discourse assists in leading toward understanding* • *Application of the "big ideas" are readdressed within the same school year and across years*	
Explain: "To see how these core ideas progress across grade bands, a progressions document, Appendix E, was developed. The information provided here is not exhaustive of all the elements of the DCIs, but does provide a general overview of how an idea increases in depth and sophistication over time." *Slides 13-16 provide further background about the DCIs and the progressions from K-HS. Participants will need access to Appendix E as they will be using this during the exploration described in Slide 16. You should determine when would be best for participants to access Appendix E.*	

Facilitator Notes	Accompanying Slide(s)
This is a sample page showing the progression of some of the Physical Science progressions.	
Explain: "Take a few moments to explore the DCI progressions." *Facilitator Notes:* *Allow participants two or three minutes to individually explore Appendix E. After this time, lead a discussion of the large group, sharing their findings, surprises, ah-ha's, etc.* *Some findings to point out:* • *Some sub-DCIs at particular grade-bands contain an "N/A" (e.g., PS3.A for K-2)* • *Some sub-DCIs are combined into a single statement for some grade bands (e.g., LS3.A & LS3.B for K-2 and 3-5)* • *Some content for a given sub-DCI is located elsewhere (e.g., LS2.B for K-2)* **Important Note: The progressions shown in this Appendix provide a big picture of the core ideas presented. In addition, these are expectations at the end of the grade band. More detail about each core idea is provided in the Framework. A resource that goes into further detail for each progression is [Disciplinary Core Ideas: Reshaping Teaching and Learning]*	

Facilitator Notes	Accompanying Slide(s)
Explain: "We will now explore the progressions in a bit more depth." *Possible set-ups for this exploration:* • *Whole group looking at the same sub-DCI(s)* • *Small heterogeneous groups having discussions about different sub-DCIs. Findings could be posted and a gallery walk/carousel could follow.* • *Small homogeneous (same grade/grade band/course) groups having discussions about different sub-DCIs and the implications for their curriculum. A jigsaw protocol could be used to share across the entire group.* *If small groups are chosen, the facilitator may wish to walk around and listen to the conversations.*	
Explain: Also incorporated within the DCIs are standards defining Engineering Design, which we will now explore." *Background Notes for Facilitators:* *The term "engineering design" has replaced the older term "technological design," consistent with the definition of engineering as a systematic practice for solving problems, and technology as the result of that practice. According to the Framework: "From a teaching and learning point of view, it is the iterative cycle of design that offers the greatest potential for applying science knowledge in the classroom and engaging in engineering practices" (NRC, 2012, pp. 201-202).* *In the NGSS, engineering design is integrated throughout the document. First, a fair number of standards in the three disciplinary areas of life, physical and earth and space sciences begin with an engineering practice. In these standards, students demonstrate their understanding of science*	

Facilitator Notes	Accompanying Slide(s)
through the application of engineering practices. Second, the NGSS also include separate standards for engineering design at the K-2, 3-5, 7-8, and 9-12 grade levels. This multi-pronged approach, including engineering design both as a set of practices and as a set of core ideas, is consistent with the original intention of the Framework. *It is important to point out that the NGSS do not put forward a full set of standards for engineering education, but rather include only practices and ideas about engineering design that are considered necessary for literate citizens.*	
Explain: "To ensure that we have a common understanding of what is meant by engineering and technology, these definitions were presented in the *Framework*. These are the definitions we will be using as we think about engineering and technology as used in the *KAS for Science*." *Facilitator Notes:* *The Framework's definitions address two common misconceptions. The first is that engineering design is not just applied science. As described in Appendix F, the practices of engineering have much in common with the practices of science, although engineering design has a different purpose and product than scientific inquiry. The second misconception is that technology describes all the ways that people have modified the natural world to meet their needs and wants. Technology does not refer to just computers or electronic devices.* *The purpose of defining "engineering" more broadly in the Framework and the NGSS is to emphasize engineering design practices that all citizens should learn. For example, students are expected to be able to define problems—situations that people wish to change—by specifying criteria and constraints for acceptable solutions, generating and evaluating multiple solutions, building and testing prototypes, and optimizing a solution.*	

Facilitator Notes	Accompanying Slide(s)
Explain: "Engineering design is based upon the design cycle. Notice how this cycle is iterative and not moving in a single direction. What implications does this have for science education?" *The question posed is a thought-question. Facilitators may wish to have people share out their ideas to the whole group, share at a table, or have an individual think time.* *Facilitator Notes:* *The emphasis here is on the idea that there is no clear-cut solution to any problem, and that such solutions can possibly become "better" (optimized). The classic example is the cleaning product, Formula-409. The number "409" represents the 409th formula developed that solved the defined problem.*	
Explain: "We will now take some time to explore Appendix I, which shows the progression of engineering design for each grade band." *Facilitator Notes:* *Allow participants 2-3 minutes to individually explore Appendix I. After this time, lead a discussion with the large group, sharing their findings and thoughts to the questions posed in this slide.*	

Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *Remind participants of the learning experienced in this section, using information on the slide as guidance. You may also bring out any points or ideas that were brought out during any of the discussions.*	

Module 1: The *Kentucky Academic Standards (KAS) for Science*: An Overview

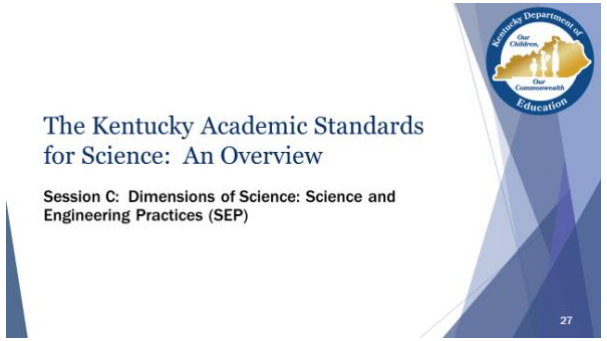
Preparation for Session C: Dimensions of Science: Science and Engineering Practices (SEP)

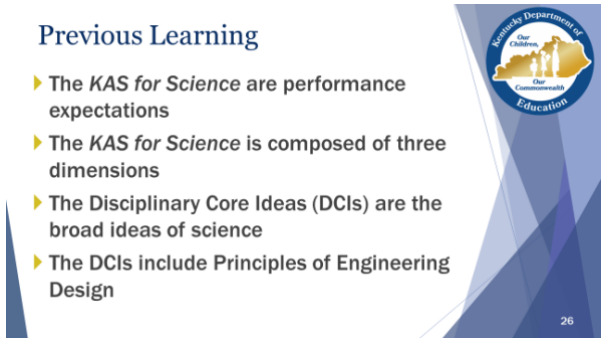
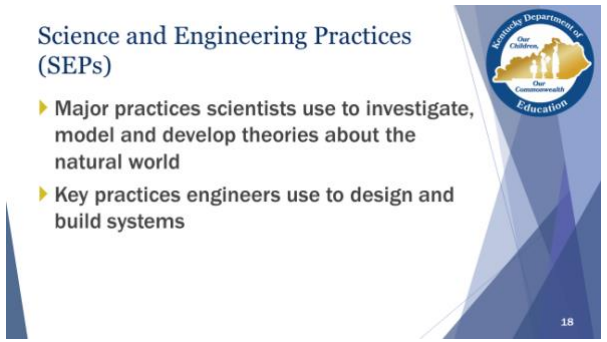
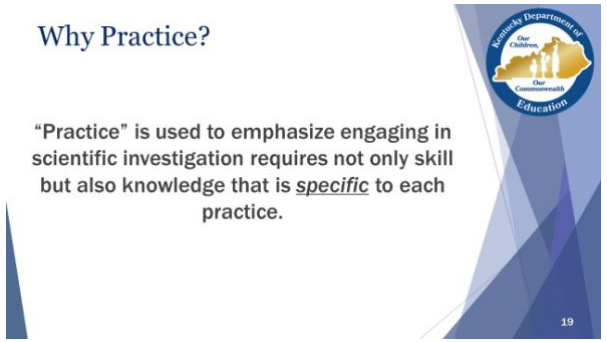
Facilitator Work Session Supplies Needed:

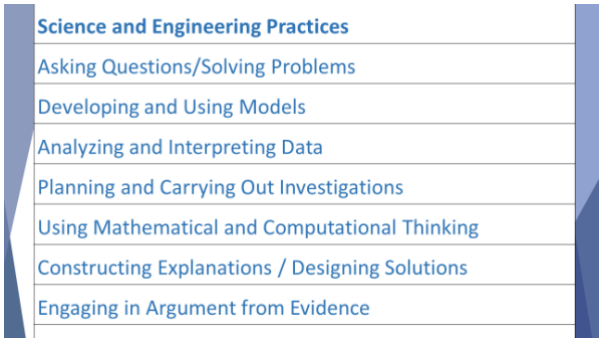
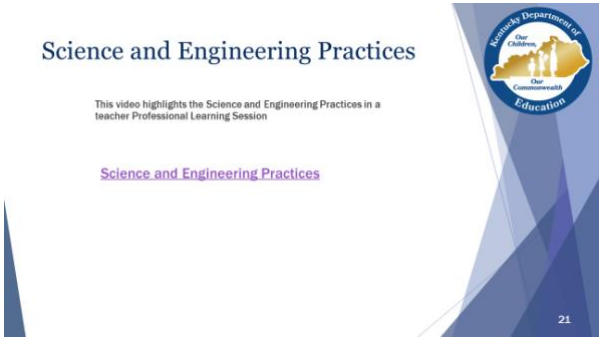
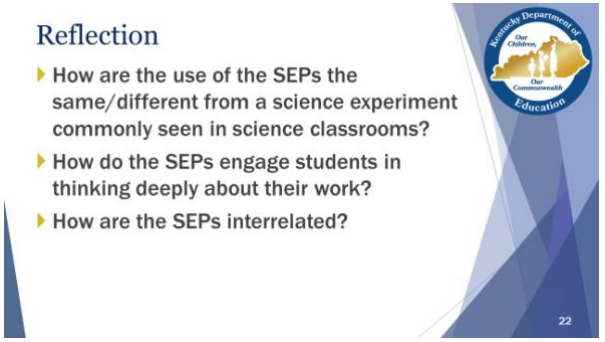
These items will be needed with this module.

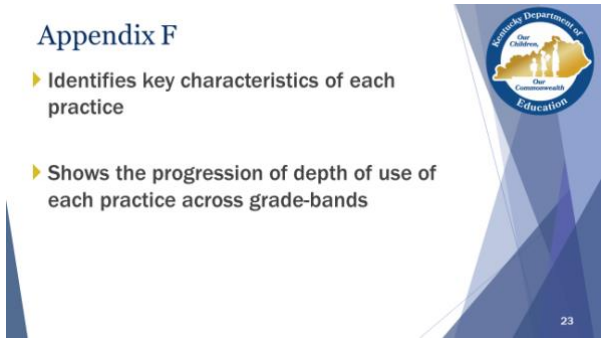
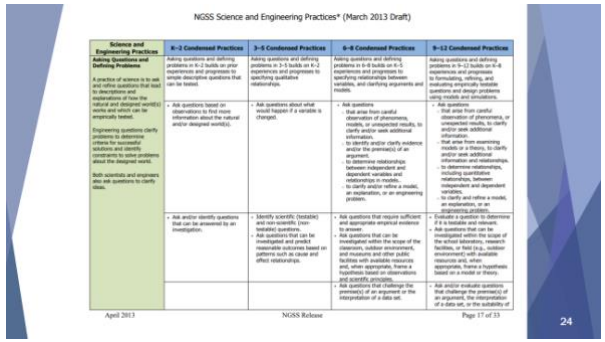
- Computer with access to the *KAS for Science: An Overview* slide presentation
- Technology with projection capability including a speaker system
- Appendix F (paper or electronic)
- Poster paper (if facilitator chooses posting of findings and sharing)
- Self-sticking notes (if facilitator chooses posting of findings and sharing)

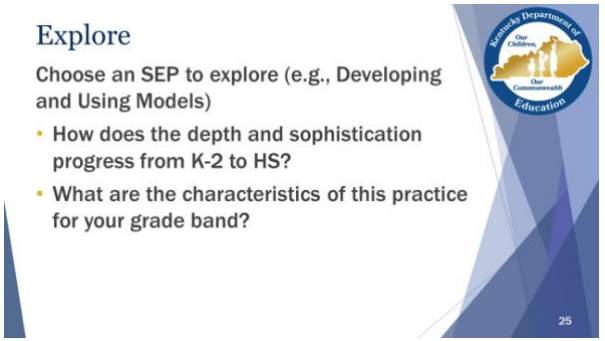
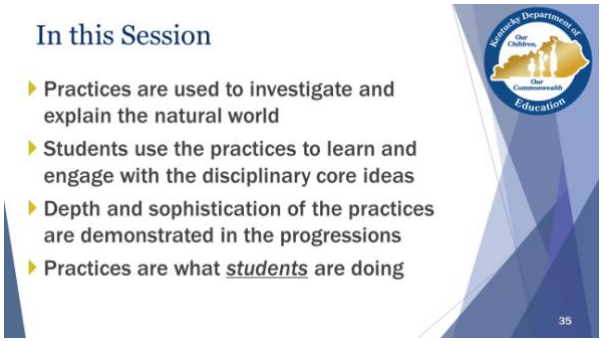
Session C: Dimensions of Science: Science and Engineering Practices (SEP)

Facilitator Notes	Accompanying Slide(s)
Explain: "We will now be looking at the next dimension: The Science and Engineering Practices. These are often referred to as the SEPs or the Practices. *Background Notes for Facilitator:* *Engaging in the practices of science helps students understand how scientific knowledge develops; such direct involvement gives them an appreciation of the wide range of approaches that are used to investigate, model, and explain the world. Engaging in the practices of engineering likewise helps students understand the work of engineers, as well as the links between engineering and science. Participation in these practices makes students' knowledge more meaningful and embed it more deeply into their worldview.* *The actual doing of science or engineering can also pique students' curiosity, capture their interest, and motivate their continued study; the insights thus gained help them recognize that the work of scientists and engineers is a creative endeavor—one that has deeply affected the world they live in. Students may then recognize that science and engineering can contribute to meeting many of the major challenges that confront society today.* *Any education that focuses predominantly on the detailed products of scientific labor—the facts of science—without developing an understanding of how those facts were established ignores the many important applications of science in the world misrepresents science and marginalizes the importance of engineering. (NRC, 2012, pp. 42-43)* *An additional resource that goes into further detail about the Science and Engineering Practices is [Helping Students Make Sense of the World](#).*	

Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *Briefly review learning and experiences from the previous learning, using information on this slide for guidance. You may also bring out any discussions that came out in the previous session.*	
Explain: "Key to the vision expressed in the *Framework* is that students learn the Disciplinary Core Ideas (DCIs) in the context of science and engineering practices. Students are expected to be able to use understanding of the DCIs to investigate the natural world through the practice of science inquiry, and can solve meaningful problems through the practices of engineering design."	
This explains the rationale by the Framework committee as to why we speak about practices of science instead of science inquiry.	

Facilitator Notes	Accompanying Slide(s)
Explain: These are the eight Science and Engineering Practices. It is important to remember that these are practices in which <u>students</u> are engaged with during the course of instruction.	
This video describes the reasons for the practices and why they are important. After watching the video, participants will be asked to reflect on what they saw and heard. Facilitators may wish to share the questions shown on the next slide in order to set the stage for the video.	
After watching the video, participants should reflect on these three questions. How this reflection could occur is up to the facilitator. However, it is recommended that participants be provided time to reflect individually first before whole group reflection/discussion occurs. *Ideas to listen for:* • *Engagement of the practices is more than just "doing" them, but leads to further questioning and depth of understanding* • *"Traditional" science labs often do not lead towards explanation or argumentation that demonstrates true understanding of a concept* • *Instruction with the practices is beyond confirming information, but often leads to further questioning.*	

Facilitator Notes	Accompanying Slide(s)
Explain: "To see how the SEPs progress across grade bands, a progression document, Appendix F, was developed. Here you can see the characteristics of each SEP at each grade band. *Talking Points:* • *Even though specific SEPs are identified for each PE, students should have experiences utilizing <u>all</u> of the SEPs.* • *While the SEPs are identified, they actually work with one another such that it is often hard to distinguish one from another.* *Slides 27-29 provide further background about the SEPs and the progressions from K-HS. Participants will need access to Appendix F as they will be using this during the exploration described in slide 27. You should determine when would be best for participants to access Appendix F.*	
Explain: "This is a sample page showing the progression of the SEP Asking Questions and Defining Problems." *Facilitator Notes:* *There are two different layouts for the progressions: a table form (pp. 4-15) and a chart form (pp. 17-32). Both layouts have the same information. The chart layout, however, shows how each element of the SEP progresses across grade-bands.*	

Facilitator Notes	Accompanying Slide(s)
Explain: "We will now explore the progressions in a bit more detail." *Possible set-ups for this exploration:* • *Whole group discussion looking at the same SEP from K-HS* • *Small groups looking at different SEP progressions from K-HS. Small groups would then share out how depth and sophistication progress, jigsaw findings, post on chart paper, etc.* *If small groups are chosen, the facilitator may wish to walk around and listen to the conversations.*	
Facilitator Notes: *Remind participants of the learning experienced in this section, using information on the slide as guidance. You may also bring out any points or ideas that were brought out during any of the discussions.*	

Module 1: The *Kentucky Academic Standards (KAS) for Science*: An Overview

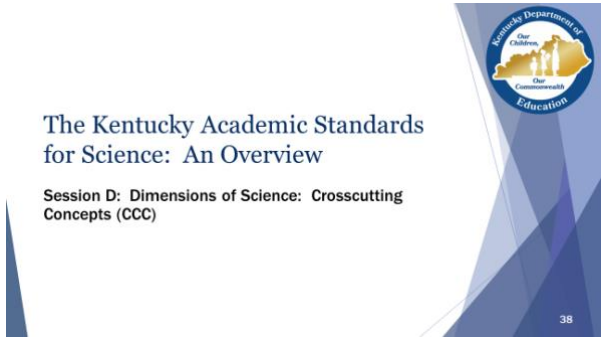
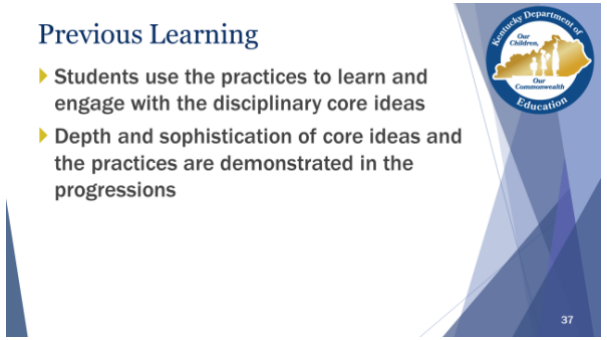
Preparation for Session D: Dimensions of Science: Crosscutting Concepts (CCC)

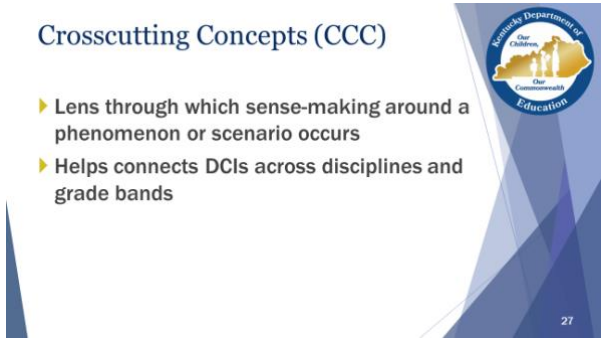
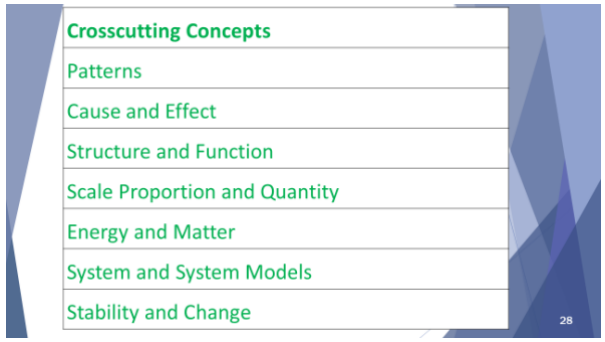
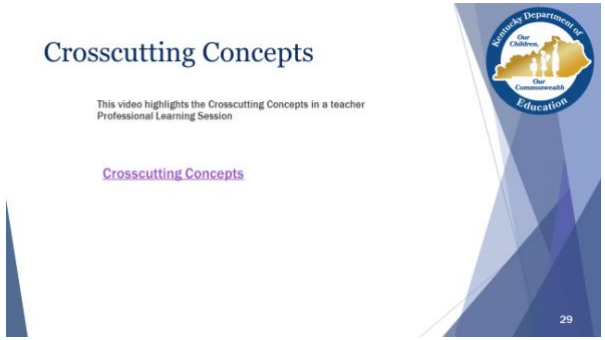
Facilitator Work Session Supplies Needed:

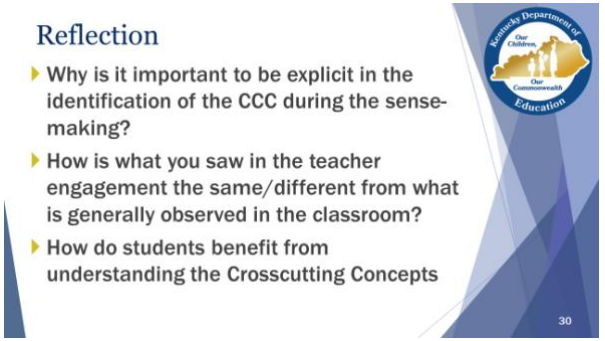
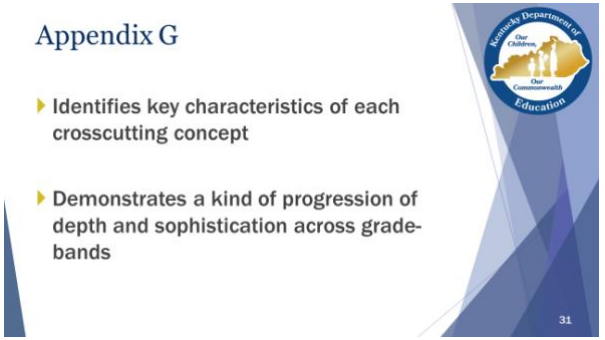
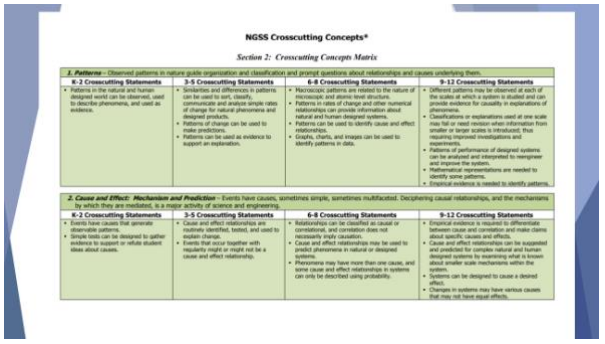
These items will be needed with this module.

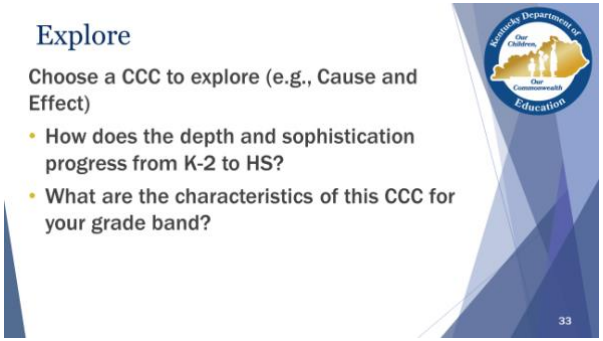
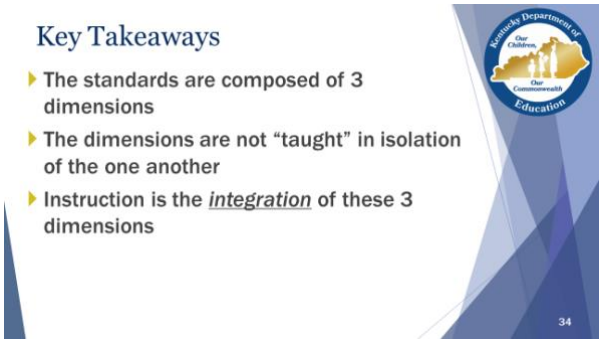
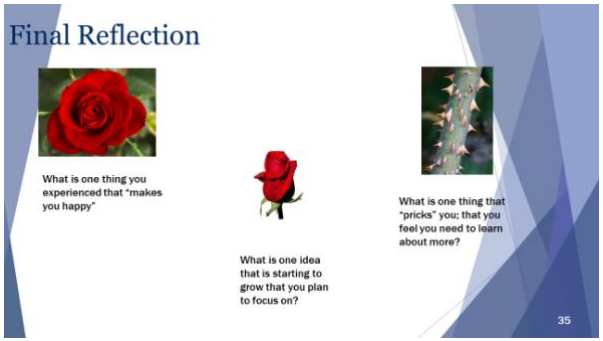
- Computer with access to the *KAS for Science: An Overview* slide presentation
- Technology with projection capability including a speaker system
- Appendix G (paper or electronic)
- Poster paper (if facilitator chooses posting of findings and sharing)
- Self-sticking notes (if facilitator chooses posting of findings and sharing)

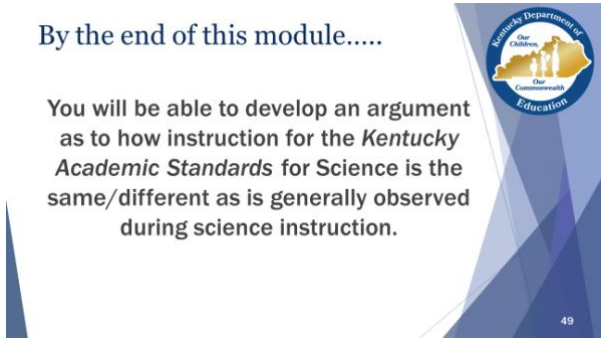
Session D: Dimensions of Science: Crosscutting Concepts (CCC)

Facilitator Notes	Accompanying Slide(s)
Explain: "We will now be looking at the third dimension: the crosscutting concepts, or CCCs." *Background Notes for Facilitators:* *According to the Framework, the purpose of the CCCs is to help students deepen their understanding of the disciplinary core ideas and develop a coherent and scientifically based view of the world. While "crosscutting ideas" have been featured in other framework documents over the past two decades, the Framework recognizes that "students have often been expected to build such knowledge without any explicit instructional support. Hence the purpose of highlighting them as Dimension 2 of the Framework is to elevate their role in the development of standards, curricula, instruction, and assessments" (NRC, 2012, p. 83).*	
Facilitator Notes: *Briefly review learning and experiences from the previous learning, using information on this slide for guidance. You may also bring out any discussions that came out in the previous session.*	

Facilitator Notes	Accompanying Slide(s)
Explain: "The Framework identifies seven CCC that bridge disciplinary boundaries, uniting core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the DCIs and develop a coherent and scientifically based view of the world."	
Explain: "These are the seven crosscutting concepts. Much like the practices, the CCCs are often intertwined and hard to distinguish." *Talking Points (some examples to share):* • *Students may use patterns in data in order to identify cause and effect relationships.* • *Students may study a system at different scales.*	
This video describes the importance of the crosscutting concepts in the understanding of science and the natural world at large. After watching the video, participants will be asked to reflect on what they saw and heard.	

Facilitator Notes	Accompanying Slide(s)
After watching the video, participants should reflect on these three questions. How this reflection could occur is up to the facilitator. However, it is recommended that participants be provided time to reflect individually first before whole group reflection/discussion occurs. *Ideas to listen for:* • *CCC are used by students to organize ideas and make sense of the science around a phenomenon* • *CCC are ideas that can be used within disciplines or across disciplines* • *CCC are used in conjunction with the practices in the understanding of phenomena*	
Explain: "To see how the CCCs progress across grade bands, a progressions document, Appendix G, was developed. Here you can see the characteristics of each CCC at each grade-band. *Facilitator Notes:* *Slides 35-37 provide further background about the CCC and the progressions from K-HS. Participants will need access to Appendix G as they will be using this during the exploration described in slide 37. You should determine when would be best for participants to access Appendix G.*	
Explain: "This is a sample page showing the progression of the two CCCs Patterns, and Cause and Effect" *Facilitator Notes:* *There are two different layouts for the progressions: a narrative (pp. 3-11) and a chart form (pp. 15-17). The chart form is where you will find the specific characteristics for each CCC.*	

Facilitator Notes	Accompanying Slide(s)
Explain: "We will now explore the progressions in a bit more depth." *Possible Set-ups for this exploration:* • *Whole group discussion looking at the same CCC from K-HS* • *Small groups looking at different CCC progressions from K-HS. Small groups would then share out how depth and sophistication progress, jigsaw findings, post on chart paper, etc.* *If small groups are chosen, the facilitator may wish to walk around and listen to the conversations.*	
After completing the learning experiences within this module, these are the three key takeaways participants should walk away with. You may wish to ask to probe participants as to their big takeaways and/or ideas from the learning.	
This is a reflection exercise called "rose, bud and thorn". The rose is a used to represent a learning that is "blossoming" in the participant's understanding. The bud represents something that is forming but not yet blossomed into something meaningful. The thorn represents some learning that is "hurtful"; an idea about whicht a participant may need more information. Facilitators can use this information to determine what supports educators may need or what further information may be needed to help bring clarity to the science dimensions. This reflection is intended for participants to think about all of the learning that has occurred throughout the course of this module.	

Facilitator Notes	Accompanying Slide(s)
After participants have engaged with all sessions within this module, they will develop an "elevator speech" addressing this statement. An elevator speech is a quick 1 or 2 minute talk that provides a quick synopsis of a particular topic. As participants are writing this in the form of an argument, their elevator speech should have a claim, evidence to support their claim and how that evidence supports their claim. *As time permits, you may wish to have participants share their speech with one another in order to receive feedback to clarify any points in support of their claim.*	
Explain: "The KDE needs your feedback on the effectiveness of this module, the learning platform and how the consultants may best support you as you take the next steps. We are going to complete a short survey to share our thinking and provide them with feedback on how the KDE can best meet our needs. Feedback from our surveys will be used by the KDE to plan and prepare future professional learning." *Provide participants with the survey links:* ● *Module 1 Teacher Survey: https://www.surveymonkey.com/r/DPKRQQ2* ● *Module 1 District/Administrator Survey: https://www.surveymonkey.com/r/DPSGXC6* *Be sure to thank participants for their work throughout this module as it has provided a foundation for future knowledge.* *To you, the facilitator, thank you for providing participants with knowledge and support throughout this process. The KDE greatly values your role in facilitating Module 1. We appreciate your time and effort in leading your school and district in the successful implementation of the KAS for Science. Thank you!*